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The moduli space of asymptotically conical G_2 manifolds

A theorem of Dominic Joyce says that the moduli space of compact G_2 manifolds is smooth of dimension equal to the 3rd Betti number of the manifold. We study the moduli space question for noncompact G_2 manifolds with one end, asymptotic to a metric cone of G_2 holonomy. This includes the explicit Bryant-Salamon manifolds as examples. We prove that this moduli space is smooth and unobstructed when the rate of convergence to the cone at infinity lies within a certain range. The dimension of this moduli space includes a component which is topological and a component which is analytic, arising from the existence of certain solutions to an eigenvalue equation on the link of the asymptotic cone. We also consider the moduli space question for G_2 manifolds with isolated conical singularities. In this case there are always analytic obstructions, and we describe these. This is joint work with Jason Lotay of University College London.